

Lentil, Sowing Time, MRZ Wimmera (Horsham), Victoria

Aim

To investigate the adaptability of a range of lentil varieties and breeding lines to varying sowing dates.

Treatments

Varieties: See Table 1

Sowing Dates: April 20 'D' (dry sown), April 20 'I' irrigated with 10mm), May 04, May 18, June 01

Other Site Details

Stubble height (cm)	Standing (20)
Row Spacing (cm)	36
Fertiliser (kg/ha)¹	80
Plant density (plants/m²)	120

1. MAP (9.2, 20.2, 0, 2.7) + Zn (2.5)

Results and Interpretation

- **Key Messages:** Grain yields of varieties and breeding lines were very low due to dry seasonal conditions and extreme temperature events (heat and frost) during the growing season. Hence, results of this trial should be interpreted with caution. Long-term data and additional information should be considered when making varietal or agronomic decisions.
- Several frosts during the flowering and podding phase significantly impacted grain yields, particularly the earlier sown treatments which were further advanced in the reproductive phase and unable to recover. As a result, the trends observed in 2018 are completely opposite to long term trial results for lentil, which generally indicate significant benefits from earlier sowing.
- The mid/late maturing lines CIPAL1504 and CIPAL1522 have consistently performed well across multiple seasons, highlighting the yield potential of advanced lines coming through the breeding program.
- **Establishment and Plant Growth:** Establishment of lentil varieties and breeding lines was very slow and highly variable due to extremely dry seasonal conditions. Establishment counts were also influenced by high incidence of mice earlier in the season. Hence, results of this trial need to be treated with caution. Despite these limitations, establishment was obviously higher when sown early and irrigated with 10mm of water (Apr 20 'I') than dry sowing on the same date (Table 1). Growth throughout the season was poor due to extremely dry conditions except in the April 20 'I' treatment, where growth of lentil varieties and breeding lines was relatively more vigorous than other treatments. Several frosts during the flowering and podding phase caused significant flower and pod abortion, particularly in the earlier sown treatments which were further advanced in the reproductive phase. Among the varieties/breeding lines, CIPAL1721 and PBA Greenfield showed less visual frost damage symptoms than others, while 'L1' had the most frost damage symptoms followed by PBA Hurricane XT and CIPAL1522 during the vegetative stage (data not shown).

Table 1. Establishment (plants/m²) of lentil varieties and breeding lines at Horsham, Victoria in 2018.

Variety	Establishment (plants/m ²)					
	Apr 20 'D'	Apr 20 'I'	May 04	May 18	June 01	Ave
CIPAL1504	91	92	98	102	93	95
CIPAL1522	83	106	86	101	95	94
CIPAL1721	95	98	98	105	89	97
PBA Hurricane XT	89	109	91	87	84	92
'L1'	86	104	66	90	86	86
PBA Ace	74	97	99	91	94	91
PBA Greenfield	94	111	89	99	105	100
PBA Jumbo2	100	103	87	85	99	95
Ave	89	103	89	95	93	94
LSD_{TOS} (P<0.05)	ns					
LSD_{Var} (P<0.05)	7					
LSD_{TOS*Var} (P<0.05)	22					
CV	12.2					

- **Biomass:** Biomass at maturity varied significantly between varieties and breeding lines, but this depended on time of sowing. The varieties and breeding lines generally produced the equal highest biomass when sown on April 20 'D' and on May 18 except PBA Jumbo2, and biomass was reduced by up to 31% when sowing was delayed from April 20 'D' and May 18 to June 01 (Table 2). PBA Jumbo2 was most responsive to the early sowing, producing the highest biomass when sown dry at the earliest date (April 20) equivalent to sowing on May 04, with 26, 29 and 31% higher biomass than sowing on April 20 'I', May 18 and June 01 respectively (Table 2). Vegetative frost significantly impacted biomass accumulation in the April 20 'I' treatment. In contrast, CIPAL1522, 'L1' and PBA Ace were the least responsive to earlier sowing, with 12-25% less biomass when sown on April 20 and May 04 compared to sowing on May 18 (Table 2). PBA Hurricane XT and PBA Greenfield both had 28 and 31% less biomass when sown on May 04 than sowing on April 20 'D' and April 20 'I', respectively (Table 2).

Table 2. Biomass at maturity (t/ha) of lentil varieties and breeding lines sown at various dates at Horsham in 2018.

Variety	Biomass @ maturity (t/ha)					
	Apr 20 'D'	Apr 20 'I'	May 04	May 18	June 01	Ave
CIPAL1504	2.84	2.53	2.33	2.67	1.99	2.47
CIPAL1522	2.61	2.42	2.39	2.95	2.03	2.48
CIPAL1721	2.62	2.35	2.39	2.36	1.90	2.32
PBA Hurricane XT	2.46	2.58	1.78	2.61	1.81	2.25
'L1'	2.53	2.53	2.18	2.89	2.29	2.48
PBA Ace	2.30	2.35	2.29	2.91	2.38	2.45
PBA Greenfield	2.46	2.58	1.78	2.61	1.81	2.25
PBA Jumbo2	2.84	2.11	2.74	2.01	1.96	2.33
Ave	2.58	2.43	2.24	2.63	2.02	2.38
LSD_{TOS} (P<0.05)	ns					
LSD_{Var} (P<0.05)	ns					
LSD_{TOS*Var} (P<0.05)	0.66					
CV	15.0					

- **Grain Yield:** Grain yield of varieties and breeding lines were very low due to dry seasonal conditions and extreme temperature events during the growing season. Hence, results are highly variable and should be interpreted with caution. A significant sowing date by variety response was found for grain yield, indicating that varieties yielded differently depending on sowing date. Overall, all varieties and breeding lines achieved the highest yield when sown on May 18, while the lowest yield was obtained when sown

early on April 20 and irrigated with 10mm of water (Figure 1). Early sowing with irrigation considerably increased early crop growth and lead to earlier flowering, which increased the risk of frost damage during vegetative and reproductive growth stage and caused substantial yield reduction. Furthermore, high early biomass accumulation under such dry seasonal conditions might have led to stored soil water being used before flowering and subsequent haying off. The varieties and breeding lines did not have significant yield differences when sown April 20 'D' and May 04 except PBA Hurricane XT, which had less grain yield when sown at the later date (Figure 1). The breeding line CIPAL1504 had similar yield across all sowing dates except when sown on April 20 and irrigated with 10mm water, indicating its wider sowing window. Among the varieties, PBA Ace and PBA Greenfield had the highest yield reduction of 49-54% from dry sowing at the earliest date (April 20) compared to sowing on May 18 (Figure 1). Similarly, 'L1', PBA Jumbo2 and CIPAL1522 incurred a 28-33% yield loss from dry sowing (April 20) compared to sowing on May 18 (Figure 1). The breeding lines CIPAL1504, CIPAL1721 and variety PBA Hurricane XT did not have significant yield loss from dry sowing at the earliest sowing date (April 20). The early maturing line CIPAL1721 did not have significant yield loss from delaying sowing from May 18 to June 01 (Figure 1). PBA Ace had the highest yield loss of 43% from delaying sowing from May 18 to June 01 followed by PBA Jumbo 2 (30%), PBA Greenfield (27%), CIPAL1522 (26%), 10H202L (23%) and PBA Hurricane XT (22%) as shown in Figure 1.

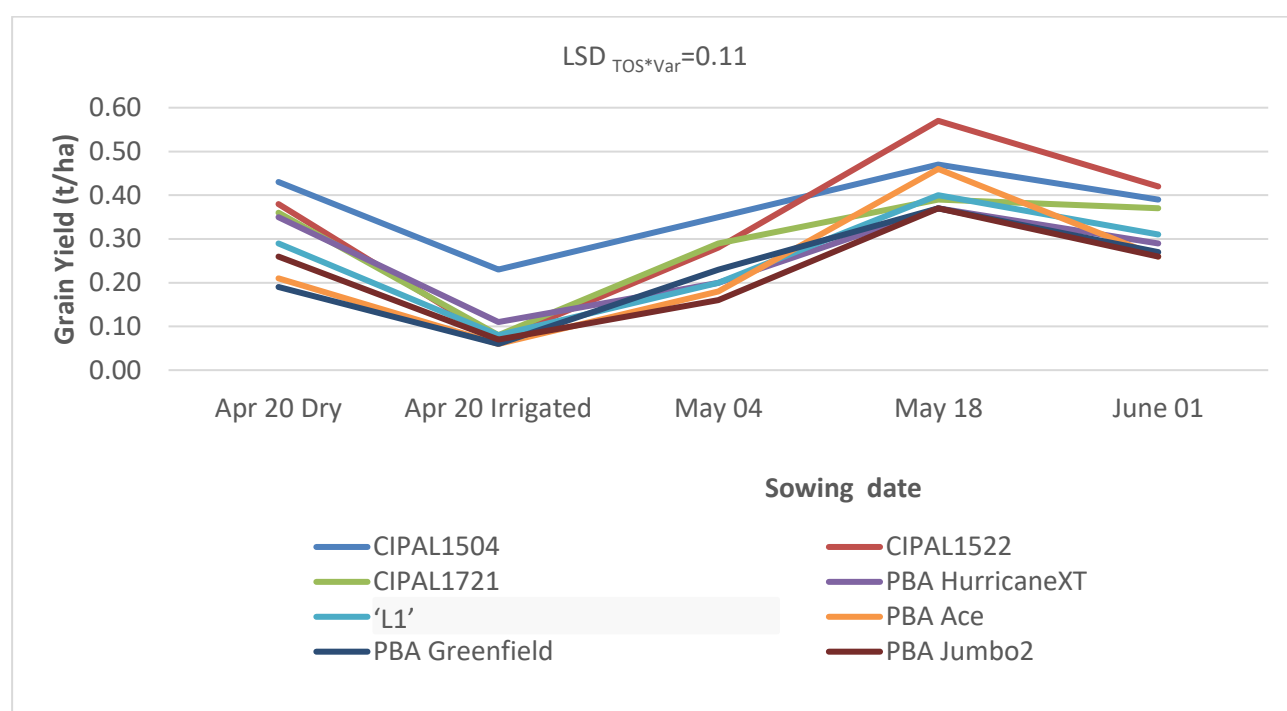


Figure 1. Grain yield (t/ha) of lentil varieties and breeding lines as influenced by sowing condition and date at Horsham in 2018.

- Harvest Index:** Harvest index varied significantly between sowing dates and ranged between 0.05 and 0.17 (Table 3). Harvest index generally increased as sowing was delayed and sowing at the earliest dates (April 20) and irrigating with 10mm of water resulted in the lowest harvest index (Table 3). This could be due to several frosts during the flowering and podding phase which impacted grain yields significantly, particularly the early sown treatments which were further advanced in the reproductive phase and unable to recover. The reduced harvest index in the earlier sown treatments could also be due to high early biomass accumulation which might have led to available soil water being used before the reproductive phase. The equal highest harvest indexes were achieved when varieties and breeding lines were sown on May 18 and June 01 (Table 3). Harvest index of lentil varieties and breeding lines followed a similar trend with differences in grain yield. The breeding lines CIPAL1504 and CIPAL1522 had higher harvest index than the commercial varieties (Table 3). PBA Ace had significantly lower harvest index than CIPAL1504 (Table 3).

Table 3. Harvest index of lentil varieties and breeding lines sown at various dates at Horsham in 2018.

Variety	Harvest Index					Ave
	Apr 20 'D'	Apr 20 'I'	May 04	May 18	June 01	
CIPAL1504	0.15	0.10	0.14	0.18	0.20	0.15
CIPAL1522	0.15	0.04	0.11	0.20	0.21	0.14
CIPAL1721	0.14	0.05	0.12	0.18	0.18	0.13
PBA HurricaneXT	0.14	0.06	0.11	0.15	0.16	0.12
'L1'	0.11	0.04	0.07	0.14	0.13	0.10
PBA Ace	0.09	0.04	0.08	0.16	0.11	0.10
PBA Greenfield	0.08	0.05	0.10	0.15	0.13	0.10
PBA Jumbo2	0.09	0.05	0.06	0.18	0.13	0.10
Ave	0.12	0.05	0.10	0.17	0.16	0.12
LSD_{TOS} (P<0.001)			0.02			
LSD_{Var} (P<0.001)			0.02			
LSD_{TOS*Var} (P<0.05)			ns			
CV			26.0			